

PATENT COOPERATION TREATY

PCT

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference TS 6433 PCT	FOR FURTHER ACTION		See Form PCT/PEA/416
International application No. PCT/EP2004/052593	International filing date (day/month/year) 20.10.2004	Priority date (day/month/year) 21.10.2003	
International Patent Classification (IPC) or national classification and IPC E21B7/18, E21B10/60, B24C1/04, B24C5/04, E21B41.00			
Applicant SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ B.V. et			
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> <i>(sent to the applicant and to the International Bureau)</i> a total of 1 sheets, as follows:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions). <input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box. <p>b. <input type="checkbox"/> <i>(sent to the International Bureau only)</i> a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>			
<p>4. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Box No. I Basis of the opinion <input type="checkbox"/> Box No. II Priority <input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability <input type="checkbox"/> Box No. IV Lack of unity of invention <input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement <input type="checkbox"/> Box No. VI Certain documents cited <input type="checkbox"/> Box No. VII Certain defects in the international application <input type="checkbox"/> Box No. VIII Certain observations on the International application 			
Date of submission of the demand 27.07.2005	Date of completion of this report 07.11.2005		
Name and mailing address of the International preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Fax: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer Schouten, A Telephone No. +31 70 340-4088		



**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/EP2004/052593

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
 - This report is based on translations from the original language into the following language, which is the language of a translation furnished for the purposes of:
 - international search (under Rules 12.3 and 23.1(b))
 - publication of the international application (under Rule 12.4)
 - international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements*** of the international application, this report is based on (replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):

Description, Pages

1-19 as originally filed

Claims, Numbers

5-11 as originally filed
1-4 received on 30.08.2005 with letter of 30.08.2005

Drawings, Sheets

1/3-3/3 as originally filed

a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. The amendments have resulted in the cancellation of:
 - the description, pages
 - the claims, Nos.
 - the drawings, sheets/figs
 - the sequence listing (*specify*):
 - any table(s) related to sequence listing (*specify*):
4. This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
 - the description, pages
 - the claims, Nos.
 - the drawings, sheets/figs
 - the sequence listing (*specify*):
 - any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT
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Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-11
	No: Claims	
Inventive step (IS)	Yes: Claims	1-11
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-11
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

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Re Item V

- **Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

- 1 Reference is made to the following documents:

D1: EP-A1-0 119 338

D2: US-A-4.555.872

D3: EP-A1-0 526 087

- 2.1 The document D1 is regarded as being the closest prior art to the subject-matter of claim 1, and discloses on page 7, lines 21-23 and in Fig. 1 (the references in parentheses applying to this document):

Nozzle unit (1) for generating an abrasive jet, which nozzle unit (1) comprises:

- a first nozzle (9) connected to a pressurized carrier fluid supply, which first nozzle (9) in a section thereof with its highest restriction defines a first nozzle opening having a cross sectional area A1;
- a mixing chamber (10) in which the first nozzle (9) discharges;
- a second nozzle (17) connected to the mixing chamber (10), which second nozzle (17) in a section thereof with its highest restriction defines a second nozzle opening (18) having a cross sectional area A2; and
- an abrasive particle inlet (11, 12) discharging in the mixing chamber (10);

wherein the ratio A1/A2 is greater than or equal to 0.50 and lower than 1.

The subject-matter of claim 1 differs from this known nozzle unit in that the first nozzle has an inside wall aligned with an inside wall of the mixing chamber.

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

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2.2 The problem to be solved by the present invention may be regarded as: making it constructionally easier to keep the smallest dimensions of the abrasives supply opening substantially equal to the diameter of the first nozzle, while maximizing the proportion of the cross sectional area of the first nozzle to the second nozzle (see page 6, lines 23-27 of the application as filed).

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons: by aligning an inside wall of the first nozzle with an inside wall of the mixing chamber, the problem as stated above is solved.

2.3 Claims 2-10 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

2.4 Since the subject-matter of independent claim 11 corresponds to the subject matter of claim 1, the same reasoning as given for claim 1 will apply mutatis mutandis. Therefore claim 11 also meets the requirements of the PCT in respect of novelty and inventive step (Article 33(2) and 33(3) PCT).

TS 6433 PCT

C L A I M S

1. Nozzle unit for generating an abrasive jet, which nozzle unit comprises:

- a first nozzle connected to a pressurized carrier fluid supply, which first nozzle in a section thereof with its highest restriction defines a first nozzle opening having a cross sectional area A_1 ;
- a mixing chamber in which the first nozzle discharges;
- a second nozzle connected to the mixing chamber, which second nozzle in a section thereof with its highest restriction defines a second nozzle opening having a cross sectional area A_2 ; and
- an abrasive particle inlet discharging in the mixing chamber;

15 wherein the ratio A_1/A_2 is greater than or equal to 0.50 and lower than 1, wherein the first nozzle has an inside wall aligned with an inside wall of the mixing chamber.

2. Nozzle unit according to claim 1, wherein the length in flow direction of the mixing chamber is such, that taking into account the divergence of the jet to be discharged from the first nozzle, the diameter of the jet leaving the mixing chamber is smaller than the diameter of the second nozzle opening.

3. Nozzle unit according to claim 1 or 2, wherein the length in flow direction of the mixing chamber is in the range of 0.8-2.0 times the diameter of the first nozzle opening.

4. Nozzle unit according to any of the preceding claims, wherein the length in flow direction of the second nozzle is in the range of 4-10 times the second nozzle diameter.

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